MCB 4304 - Genetics of Microorganisms – 3 Credits MCB 6937 - Advanced Molecular Genetics – 3 Credits Syllabus - Summer 2025

Course Summary: Organisms use genetic instructions encoded in DNA. In this course, we will explore the multifaceted roles of nucleic acids and proteins (including enzymes) in genetics of prokaryotes and eukaryotes. We will also discuss the similarities and differences between viruses, prokaryotes, and eukaryotes. We will discuss the molecular structure and biochemistry of DNA and RNA, how genes and genomes are arranged, how DNA is mutated and repaired, and the machinery that is used to transcribe and translate RNA across different major branches of the tree of life, including both eukaryotic and prokaryotic systems. We will also emphasize several key techniques used to manipulate and study these systems.

Course Objectives: the main goal of this course is to endow students with a foundational knowledge and understanding of the molecules involved with the transmission, utilization, and evolution of genetic information, particularly in the microorganism realm. Achieving this goal should empower students to think critically and create connections about how molecular genetic processes are connected to and interact with macro-scale processes in other areas of research and everyday life. By the end of this course, students should be able to:

- Define and explain both nucleic acid and protein biochemistry involved in genetics
- Apply the knowledge on nucleic acid and protein biochemistry involved in genetics to predict and evaluate hypothetical experimental outcomes
- Analyze and evaluate genetic mutations and manipulation on the cell cycle, replication, and gene expression, predicting functional outcomes
- Interpret case studies involving gene expression
- Plan and design hypothetical experiments and their outcome on the gene regulation of organisms

• Generate a scientific report based on the course content

<u>Prerequisites</u>: (MCB 3020 or MCB 3023) and (MCB 3020L or MCB 3023L) with minimum grades of C.

Instructor contact: Dr. Luiz Passalacqua, email: lmoreirapassalac@ufl.edu, office: Microbiology and Cell Science Department - room 1137. <u>Please note that I do not reply outside business hours</u>. Please refer to the Canvas website for contact guidance and additional information, including TA contact information.

Course Canvas Website: TBA

Class Schedule: This class is asynchronous and can be taken 100% online via Canvas. It is

designed to follow a Tuesday-Thursday type schedule throughout the semester. The lectures are pre-recorded and uploaded to Canvas. Dates of lectures in the syllabus correspond to the intended Tues/Thurs distribution; students are encouraged but not required to follow along at approximately this pace. The quizzes and exams are timed and will only be available during the windows indicated on each module.

Textbook: Genetics: Analysis and Principles (Author: Robert Brooker). ISBN: 1266823654 / 9781266823657 <u>Recommended but not required</u>.

Office hours: Thursday period 9 (4:05-5:05 pm) via Zoom or in my office/Zoom by request.

Course Structure:

<u>MCB 4304 (undergrad version</u>): The course consists of weekly modules (see below). Two exams (week 6 and week 12) will be given. Each will account for 20% of the grade. 20% of your grades will be accounted for by quizzes (4 in total – 10 to 20 questions each). Homework assignments (4 in total) will account for 20% of the grades. Two meaningful assignments (read below) will account for the remaining 20% of your grade.

<u>MCB 6937 (grad version</u>): The course consists of weekly modules (see below). Two exams (week 6 and week 12) will be given. Each will account for 20% of the grade. 15% of your grades will be accounted for by quizzes (4 in total – 10 to 20 questions each). Homework assignments (4 in total) will account for 15 % of the grades. Two meaningful assignments (read below) will account for the remaining 15% of your grade. One scientific reports assignment (read below) will account for the remaining 15% of your grade.

<u>Meaningful assignments</u>:1) Science Poster. Prepare a scientific poster on a topic related to the class. This assignment can be done alone or in a group (up to 4 people per group). Please refer to the class Canvas page for full instructions. 2) Discovery of new RNA thermometers. This computer-based multi-step assignment (a detailed guide will be provided) will allow students to discover new RNA thermometer candidates in bacteria. This assignment can be done alone or in a group (up to 4 people per group). Please refer to the class Canvas page for full instructions.

Scientific reports assignment (MCB 6937 only): Prepare a scientific report review (minireview) on a topic related to the class. Minireviews are summaries of developments in the field of microbiology/molecular biology. This minireview can be done alone or in a group (up to 8 people per group). This assignment should be done throughout the semester, and Dr. Luiz Passalacqua will be available to discuss and provide feedback. Dr. Luiz Passalacqua can also help with the choice of topic if needed. Please refer to the class Canvas page for full instructions. In the event of an outstanding minireview, the person/group will be invited to publish it in a scientific journal with Dr. Luiz Passalacqua.

Important note: You may not plagiarize or use an AI text generator to complete your homework, quizzes, assignments, or exams. Each student is expected to turn in their own unique work, which will be subject to plagiarism and AI checks.

Material not covered here: Reproduction and cell division, Mendelian and non-Mendelian inheritance, Population Genetics, and Evolutionary Genetics.

Calendar of activities:

| Module (Week) 1 May 12 – 16 | Welcome Introduction Overview & Background Molecular structure of DNA and RNA Method of the week: Intro + Restriction Enzyme + PCR and RT-PCR <u>Homework 1</u> : Article - Molecular Structure of DNA - Watson and Crick |
|--------------------------------------|--|
| Module (Week) 2 May 19 – 23 | Molecular structure of chromosomes and transposable elements Method of the week: Gene cloning <u>Quiz 1</u> : Modules 1 and 2 |
| Module (Week) 3 May 26 – 30 | DNA replication Method of the week: DNA Sequencing <u>Homework 2</u> : Video - "The Most Beautiful Experiment: Meselson and Stahl" MCB 6937 only: Scientific assignments – deadline to provide choice of topic |
| Module (Week) 4 June 02 – 06 | Gene Transcription and RNA Modification Method of the week: Nucleic acid detection and DNA separation <u>Meaningful Assignment 1</u> : Science poster (due by end of Module 8) |
| Module (Week) 5 June 09 – 13 | Translation Method of the week: Blotting Methods and Methods for Analyzing DNA- and RNA- Binding Proteins Quiz 2: Modules 3, 4, and 5 |
| Module (Week) 6 June 16 – 20 | Gene Regulation in Bacteria Method of the week: Gene knockouts and transgenics Exam review session |
| EXAM 1: June 18-20 | |
| Module (Week) 7 June 30 – July 04 | Gene Regulation in Eukaryotes Method of the week: Chromatin immunoprecipitation <u>Homework 3</u> : Video - "The Genome Project Documentary" MCB 6937 only: Scientific assignments 1 – report on status of the minireview |
| Module (Week) 8 July 07 – 11 | Epigenetics Method of the week: Microscopy and Macromolecular structural biology <u>Quiz 3</u> : Modules 7 and 8 |
| Module (Week) 9 | Non-Coding RNAs |

July 14 – 18 Method of the week: CRISPR and gene editing

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| | <u>Meaningful Assignment 2</u> : Discovery of new RNA thermometers (due by end of Module 11) |
|--------------------------------------|---|
| Module (Week) 10 July 21 – 25 | Genetics of Viruses Special topic of the week: Biotechnology <u>Quiz 4</u> : Modules 9 and 10 |
| Module (Week) 11 July 28 – Aug 01 | Gene Mutation, DNA Repair, and Recombination Special topic of the week: Genomics <u>Homework 4</u> : Article - Evolution of the mutation rate – Michael Lynch |
| Module (Week) 12 Aug 04 – 08 | Genetic Transfer and Mapping in Bacteria Genetic Linkage and Mapping in Eukaryotes Special topic of the week: Genetic Basis of Cancer Exam review session MCB 6937 only: Scientific assignments 1 – deadline for final minireview manuscript |

EXAM 2: Aug 4-6

<u>Grades and Grade Points</u>: For information on current UF policies for assigning grade points, see <u>https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/</u>. Grades in this class will be determined by two exams, four quizzes, four homework, and two meaningful assignments (MCB 6937 will also have a scientific assignment). No items in this class are dropped, and there is no extra credit. Grades are determined as follows:

| Graded items % of grade: | | | | |
|--------------------------|-----------------|-----------------------|-----------------|--|
| MCB 4304 | | MCB 6937 | | |
| Exam I | 20 | Exam I | 20 | |
| Exam II | 20 | Exam II | 20 | |
| Quizzes (4x) | 20 (4 in total) | Quizzes (4x) | 15 (4 in total) | |
| Homework | 20 (4 in total) | Homework | 15 (4 in total) | |
| Meaningful assignment | 20 (2 in total) | Meaningful assignment | 15 (2 in total) | |
| | | Scientific assignment | 15 | |

<u>Exam and Proctoring Information:</u> For the exams, you must use the Chrome browser with the Honorlock extension. You are also required to procure and use an external camera with at least a 110° viewing window (I recommend this camera). Your screen and immediate surroundings will be monitored for suspicious activity and reported if anything is detected. A human proctor will review flagged incidents and send a report to the instructor. The instructor always has access to the full recordings of the test taker and the screen recording. Canvas also records a log of test taker activity during the exam.

For each exam, there is a 2.5-day window in which you can complete it. The exam windows will open at 8:00 AM EST and close at 8:00 PM EST 2.5 days later. You have 4 hours to complete the

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exam once you start it (the exam should take 1 hour; thus, you are provided with 4 times the amount of time needed to complete it), assuming you begin the exam prior to 4 PM on the last day. If you live in a different time zone, please take this into account: Canvas will lock your exam responses at 8 PM Eastern Standard Time. You can complete your exam with Honorlock proctoring at any time during the exam window. You do not need to schedule an appointment to use Honorlock. The exams are closed book with a lockdown browser.

To learn more about Honorlock, go to the student page of Honorlock and watch their quick video at: https://honorlock.com/students/

Note: If you have privacy concerns regarding Honorlock's access to your computer activity outside of the times it is required for class, the Honorlock extension can be easily removed from your browser immediately after each exam or the test quiz (you'll need to add it again for the next exam). To remove it, go to Chrome -> preferences -> settings -> extensions and select remove Honorlock.

For each homework or quiz, you will have one week to complete it. You will also have at least 3 times the time needed to complete them.

Percentage Letter Grade

≥ 90% A ≥ 87% A-≥ 83% B+ ≥ 80% B ≥ 77% B-≥ 73% C+ ≥ 70% C ≥ 65% C-≥ 55% D < 55% F

<u>Attendance and Make-Up Work</u>: Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at: <u>https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/</u>. Please contact the instructor if needed.

Online Course Evaluation Process: Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. Students are expected to provide professional and respectful feedback on the quality of instruction in this course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at: https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at: https://gatorevals.aa.ufl.edu/public-results/.

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Academic Honesty: As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code.

Class content publication and sharing policy: publication of any course material without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless, of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third-party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Software Use: All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

<u>Services for Students with Disabilities</u>: The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation 0001 Reid Hall, 352-392-8565, https://disability.ufl.edu/

Campus Helping Resources: Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The

Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance. Resources are listed below:

• U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit <u>U Matter, We Care website</u> to refer or report a concern and a team member will reach out to the student in distress.

• Counseling and Wellness Center: Visit the <u>Counseling and Wellness Center website</u> or call 352-392-1575 for information on crisis services as well as non-crisis services.

• Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the <u>Student Health Care Center website</u>.

• University Police Department: Visit <u>UF Police Department website</u> or call 352-392-1111 (or 9-1-1 for emergencies).

• UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the <u>UF</u> <u>Health Emergency Room and Trauma Center website</u>.

• GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the <u>GatorWell website</u> or call 352-273-4450.

Academic Resources:

- E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via email at <u>helpdesk@ufl.edu</u>.
- Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.
- Library Support: Various ways to receive assistance with respect to using the libraries or finding resources. Call 866-281-6309 or email ask@ufl.libanswers.com for more information.
- Teaching Center: 1317 Turlington Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.
- Writing Studio: Daytime (9:30am-3:30pm): 2215 Turlington Hall, 352-846-1138 | Evening (5:00pm-7:00pm): 1545 W University Avenue (Library West, Rm. 339). Help brainstorming, formatting, and writing papers.
- Student Success Initiative, http://studentsuccess.ufl.edu.
- Academic Complaints: Office of the Ombuds; Visit the <u>Complaint Portal webpage</u> for more information.
- Enrollment Management Complaints (Registrar, Financial Aid, Admissions): View the <u>Student</u> <u>Complaint Procedure webpage</u> for more information.
- Residential Course: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/.
- Online Course: https://pfs.tnt.aa.ufl.edu/state-authorization-status/#student-complaint